CALCULUS.

433. Proposed by LOUIS O'SHAUGHNESSY, University of Pennsylvania.

Solve the differential equation,

$$\frac{d^{1/2}y}{dx^{1/2}} - \frac{y}{x} = 0.$$

434. Proposed by E. W. CHITTENDEN, Champaign, Ill.

Evaluate $\int_0^1 f(x)dx$ where $f(x)$ is defined by the formula $f(x) = \sum_{n=1}^{n=\infty} \frac{1}{n2}$, signum $(x - x_n)$, and x_n denotes the nth number in the series $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}, \frac{1}{8}, \frac{3}{8}, \cdots$.

Note.—For a real number k, "signum k," denotes $+1, 0, -1$ according as $k >, =, < 0$.

MECHANICS.

350. Proposed by J. B. REYNOLDS, Lehigh University.

If an elastic tube filled with liquid under pressure doubles in length, in what ratio will the radius be increased?

351. Proposed by G. PAASWELL, New York City.

A transition curve is one such that its curvature varies directly with the distance measured along the curve from its point of zero curvature, that is, from the tangent. Its intrinsic equation is given by $da/ds = ks$, the constant being determined from the fact that for a given length of transition the final radius of curvature, *i. e.*, the radius of the circle into which the transition runs, is given together with the length of transition. In making a turnout from the transition curve there is as yet no direct way of computing the functions which would completely locate this turnout. In Figure 1, the point of switch is at B and the frog point at C. The angle F is given, termed the frog angle, and either the location of C or B is given, whence it is required to find either B or C and the radius of the turnout. Note that all these data must be referred finally to the center lines of the tracks and not to the individual rails. In attempting approximate solutions do not replace the transition by the cubic parabola as that is not always a good approximation. (See Crandall, *The Transition Curve* for the discussion of the properties of this curve.)

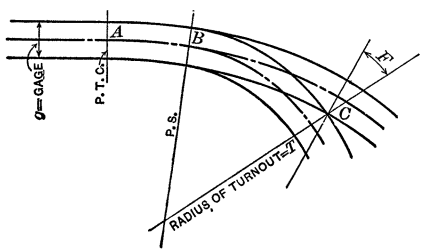

FIG. 1.

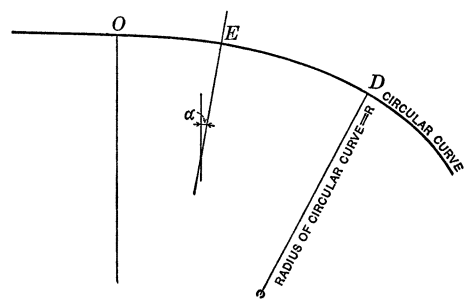

FIG. 2.

NUMBER THEORY.

268. Proposed by FRANK IRWIN, University of California.

Show that in any arithmetical progression, whose first term a_1 and common difference d are positive integers, any required number of consecutive terms may be found, no one of which is a prime number.

269. Proposed by ARTEMAS MARTIN, Washington, D. C.

Find three rectangular parallelepipedons whose edges are rational whole numbers, and their solid diagonals equal, and rational whole numbers.